



How does family health care use respond to economic shocks? realized and anticipated effects

Alan C. Monheit ^{1,2} · Irina B. Grafova¹ · Rizie Kumar¹

Received: 15 March 2018 / Accepted: 25 October 2018 / Published online: 3 November 2018
© Springer Science+Business Media, LLC, part of Springer Nature 2018

Abstract

Using two-year panel data from the Medical Expenditure Panel Survey (MEPS) for 2004 to 2012, we examine how the intra-family allocation of health care spending responds to realized and anticipated changes in family economic status. We focus on the share of total family health care spending allocated to children, and measure realized economic shocks based on changes in the family's income, employment, and health insurance status. We account for anticipated economic shocks through changes in macroeconomic indicators and time periods associated with the Great Recession. Using families as the unit of observation, we apply fractional response models with correlated random effects and two-part health expenditure models to assess how over a two-year period, family health care spending responds to economic shocks. Our findings indicate that income shocks to single-mother families result in an increase in the share of family health care spending consumed by children, while in two-parent families, economic shocks have little impact on the allocation of health spending between parents and children. Our findings for single-mother families are consistent with altruistic behavior by parents toward children.

Keywords Intrafamily resource allocation · Health care spending · Children

JEL Codes D13 · I2 · I3 · J13

1 Introduction

Families in constrained economic circumstances resulting from economic shocks – losses or reductions in employment, income, wealth, and health insurance – face

✉ Alan C. Monheit
monheiac@sph.rutgers.edu

¹ Department of Health System and Policy, Rutgers University School of Public Health, 683 Hoes Lane West, Piscataway, NJ 08854, USA

² NBER, 683 Hoes Lane West, Piscataway, NJ 08854, USA

difficult choices regarding how best to spend their diminished resources on critical necessities. As families strive to preserve their living standards, decisions regarding health care use may become far more discretionary and complex. In particular, families experiencing an economic shock may, by necessity, be required to prioritize their health care spending among family members and specific health care services. Such family decision making has implications not only for the private welfare of its members but for society more generally. For example, the inability of families to meet their health care needs can translate into delays in seeking health care, the worsening of health conditions, and the use of health care in less appropriate setting, thereby contributing to greater health care spending over time.

In this paper, we consider how economic shocks affect family health security by examining the family's response to both *realized* and *anticipated* changes in their economic circumstances, focusing on the implications for health care resource allocation between parents and children in single-mother and in two-parent families. We consider responses to a *realized* economic shock by examining how families respond to *observed* changes in their economic circumstances, as captured by losses of income, employment, and health insurance. Holding constant the changes in these observed attributes of family economic status, we also examine the impact of an *anticipated* economic shock on family health care use. We do so in two ways. First, we use the period of the Great Recession (December 2007 to June 2009) as an exogenous change in macroeconomic circumstances which may have affected the family's expectations regarding its future economic prospects. As we discuss below, survey data indicate that the Great Recession and its aftermath may have altered such expectations. Second, we also consider how the family's health care spending allocation responds to changes in specific macroeconomic indicators, such as monthly national unemployment rates, housing prices, and stock market prices. A change in these metrics also may alter the family's expectations as to its future economic prospects and lead to changes in the family's overall health care spending and its allocation among family members.¹

We implement this analysis by exploiting a series of two-year panel data sets from the Medical Expenditure Panel Survey-Household Component (MEPS). Our use of these data enables us to examine the within-family health care response to realized and anticipated economic shocks over a two-year period. Our findings suggest that both types of economic shocks had an impact by shifting the allocation of health care spending from mothers to children in single-mother families.

Finally, our paper contributes to the literature on family decision making and health care utilization in two distinct ways. First, we provide a dynamic perspective on family health care use by focusing on how the family alters its health care spending allocation over time in response to a realized or anticipated change in its economic circumstances. By examining how health care spending within the family responds to such changes, we extend research beyond the static cross-sectional analyses that typically focus on health care spending by individuals. Our analysis

¹ While not the focus of our paper, we acknowledge that changes in economic conditions associated with the business cycle can affect the health status of family members and thus the family's health care spending. However, recent research is less conclusive regarding the impact of the business cycle on health and thus on implications for health care spending (Bellés-Obrero and Castello 2018).

thus provides insight into whether and how families who previously were in more robust economic circumstances alter their health care spending when confronted with a loss of economic status. Second, our paper is consistent with and contributes to the substantial literature regarding the family's decision to allocate resources among its members. In this regard, our work builds on other research (Becker 1981, Behrman 1988, 1997; Dickie and Messman 2004, Dickie and Salois 2014, Dickie and Gerking 2009, and Rosales-Ruiz 2014) that considers the ways in which families may prioritize their allocation of resources among family members, and whether families behave altruistically toward those members who are in more vulnerable circumstances.

The plan of our paper is as follows. We begin with a brief description of the economic environment during our 2004–2012 study period, including the impact of the Great Recession, and discuss the implications for family economic and health security. Next, we describe prior research that is particularly relevant for our study and follow this with a description of the conceptual framework that motivates our analysis. We discuss the data used in our analysis and our empirical framework, and then discuss our findings and conclusions.

2 Background

2.1 Family economic security and the economic environment

Since the late 1990s and until very recently, the US economy has been characterized by instability and sluggish economic growth, threatening the economic security of many American families. This insecurity characterizes much of our study period (2004 – 2012) and is reflected in stagnant or declining real incomes; increases in accumulated household debt; difficulty in meeting rising health care and insurance costs; the threat of housing foreclosures; the tenuous nature of employment; and threats to the private safety net of pensions and retiree health benefits and to the public safety net. Over our study period, real median family income declined from \$66,670 in 2004 to \$63,145 in 2012 (Economic Policy Institute tabulations of real median family income 2014), and the unemployment rate increased from 5.7% in January 2004 to a peak of 10.0 % in October 2009, declining to 7.9% in December 2012 (Bureau of Labor Statistics 2014). Consistent with this characterization, a report from the Pew Research Center (2010) has labeled the decade beginning in 2000 as the “lost decade of the middle class.”

Apart from this general lack of economic progress, the period encompassed by the Great Recession (December 2007 to June 2009) and its immediate aftermath also profoundly affected family economic status and expectations for future wellbeing. As Hurd and Rohwedder (2010) note in their analysis of the American Life Panel survey data, by April 2010 nearly 39% of households were in financial distress with either the respondent or spouse having been unemployed, or the household having negative equity in their home, or in arrears in home payments. They also found that survey respondents' long-term expectations about stock market prices and housing prices were very pessimistic, and that workers' expectations of poor success in obtaining employment remained high. The authors concluded that respondents were not

optimistic about their economic future, suggesting the recession's impact may have significantly altered expectations.²

What is especially relevant for our study is Hurd and Rohwedder's finding of efforts by households to economize on health care spending. Specifically, they found a sharp decline in spending for prescription drugs and health care services which substantially exceeded the spending decline in 25 other spending categories (both health and non-health) surveyed. Finally, the authors also note that because of the protection health spending provides against future health declines, households economizing in this way are subject to potentially long-term negative consequences.

In sum, this brief review suggests that apart from realized economic shocks, diminished expectations about the state of the economy and about future economic prospects may also have an impact on family decision making. We consider both of these potential influences on the intra-family allocation of health spending in our analysis.

2.2 Prior research: economic shocks and family health security

Perhaps most relevant to our focus on intra-family health care decision making in response to economic shocks are papers by Karac-Mandic et al. (2013) and Karac-Mandic et al. (2014). In the former paper, the authors consider out-of-pocket (OOP) spending trends for children (ages 17 and younger) and adults using a sample of privately insured families from annual cross-sections of the MEPS for the period 2001 and 2009 which encompassed the Great Recession. They focus specifically on whether the OOP health care spending of children or adults was most affected by the recession. The authors find little evidence that the Great Recession affected such spending for most children, but find that adults experienced a decline in their OOP spending. Based on this divergence, the authors conclude that parents may reduce their own spending in difficult economic times to accommodate the health care needs of their children,

In their second paper, the authors consider the relationship between the family's OOP health care spending burden and the health care needs of children. For the period of 2002-2009 they focus on measures of unmet health care needs for children as outcomes, obtain observations for each child for two years from MEPS panel data, and consider whether outcome measures of unmet needs were sensitive to the Great Recession. The authors find that the period of the Great Recession was associated with reduced unmet needs of children, suggesting, as in their first study, that parents may have sacrificed their own use of medical care in response to difficult economic circumstances.

While these findings suggest an internal family resource allocation process that favors family members with specific health care needs (such as children), the analyses do not directly consider how specific types of economic shocks may affect such decision making. The latter is particularly important since apart from the Great Recession, families may experience economic shocks in other periods and these also

² Other research has also emphasized that changes in macroeconomic circumstances can alter expectations of future economic status. See, for example, Stephens (2004), Geiger and Scharler (2016), and Roth and Wohlfart (2018).

may have affected intra-family decision making. In our analysis, we directly consider this issue using the MEPS two-year panels to consider how families adjust to realized and anticipated changes in their economic circumstances.

In an analysis that takes advantage of the two-year MEPS panel, Schaller and Stevens (2014) consider the impact of involuntary employment loss on health, health care access, and health care utilization. They pool separate MEPS panels for the period 1996 to 2011 for individuals between 21 and 65 that are employed in the first round of the survey, obtaining a sample of over 9800 individual job losses observed over this period. Among all workers, they find that a job loss leads to reductions in health insurance but little evidence of reductions in health care use. However, if the lost job was the primary source of insurance, the authors observe reductions in physician visits and prescription drug use. The analysis does not consider how an insurance loss may lead to changes in family-level spending patterns.

Finally, Chen et al. (2014) use MEPS data for the years 2005–2006 and 2007–2009 and apply quantile regression methods to examine impact of Great Recession on health care spending along the spending distribution. They find that the Great Recession was significantly associated with reduced spending at the 10th – 50th percentiles, that its impact on spending at these lower percentiles varied by race/ethnicity, and that Great Recession was associated with increased spending on emergency department visits.

3 Conceptual framework

To motivate our study of how the intra-family allocation of health care spending responds to economic shocks and to draw implications, we apply a simple model of family decision-making based upon the widely-used uniform or common preference model (e.g., Becker 1981; Behrman 1997; Jacobson 2000; Dickie and Messman 2004; and Dickie and Salois 2014). We do so in the context of an income loss experienced by the family.³ In this model, a family utility function governed by the preferences of parental decision makers determines how health care resources are allocated among family members. Family welfare depends directly upon parental health and the health of other family members, and thus indirectly on their use of health care resources. We assume that parents have altruistic preferences with respect to their children and that this assumption has face validity since parents are interested in child quality and seek to avoid the costs associated with neglecting their children's health problems. In this framework, each family member has their own health production function which depends on purchased medical care and time, and we assume that prices for medical care are the same for all family members.

Parental decision makers maximize utility subject to the health production functions for each family member and a household budget constraint in which the pooled income of the family is allocated to health care and other commodities across family

³ A loss of health insurance also confers an income loss on the family in the form of a loss of the cost-sharing subsidy for the purchase of health care. In response, families may also reconsider how to allocate current monetary income among health care and other commodities as well as among health care for specific family members.

members. As a number of authors (e.g., Jacobson 2000; Dickie and Messman 2004; and Dickie and Salois 2014) have noted, utility maximization is obtained when the marginal utility of medical care for each family member equals their marginal costs of producing additional health, and the ratio of marginal benefits to marginal costs between any two family members determines the allocation of health spending within the family.⁴

Economic shocks can alter the allocation of health care spending among family members, and we consider how parental decision makers respond altruistically as family economic status declines. Becker's (1981) model of altruism in the family describes one such response. In his model, the altruistic decision maker draws from her income to provide resources to other family members. When this decision maker experiences a reduction in income, her consumption will decline but by less than the full reduction in income. More specifically, the altruist will "reclaim" part of the income previously allocated to her beneficiaries to offset her potential consumption loss. As a consequence, the beneficiaries' consumption will decline as the altruist either partially or fully restores her own spending. This will shift spending in favor of the altruist and away from the beneficiaries thereby increasing her share of total health spending. Thus, an economic shock which reduces income could shift spending shares in favor of the altruistic decision maker and away from other family members.

Becker makes this point in the context of a two-person husband and wife household and with regard to a generic consumption commodity. Since our discussion considers family health care spending with children, the altruist may be willing to absorb a decline in her spending (and health) in response to an economic shock in order to preserve the health of children and other vulnerable family members. In this case, the share of health spending by altruistic parents will decline and that of her beneficiaries may increase. Thus, the consequence of an economic shock on the spending shares by the altruist and beneficiary is ultimately an empirical question.

In this regard, applications of the common preference model in papers by Dickie and colleagues (cited earlier) are especially relevant for our analysis since they draw implications for the allocation of health care resources between parents and children. These papers focus on parents' willingness to pay to relieve their own illnesses relative to those of their children in response to ambient air pollution. The key metric in assessing whether parents exhibit altruistic behavior or are self-interested regarding family health care resource allocation is the magnitude of the marginal rate of substitution between child (c) and parental (p) health ($MRS_{c,p}$). If $MRS_{c,p} > 1$, parents are altruistic, allocating family income in support of their children's health and sacrificing their own health and their consumption of health care resources and other commodities; if $MRS_{c,p} = 1$, parents' valuation of child and their own health is equivalent; and if $MRS_{c,p} < 1$ parents value or prioritize their own health relative to that of their children.

⁴ In summarizing prior work, Rosales-Ruiz (2014) notes that parental decision making may be governed by *reinforcement* in which resources are allocated to the child with the best economic prospects, or by *compensation* where resources are allocated to the child who is least well off.

How the family's health care spending allocation responds to an economic shock will be determined by whether and how the $MRS_{c,p}$ changes as the family's income declines. In particular, should the $MRS_{c,p}$ increase as income declines, parents will exhibit altruistic preferences in favor of children, shifting resources to children so that the share of health care spending allocated to children will increase. Whether the response of the intra-family health spending allocation follows such altruistic preferences remains an empirical issue.

Apart from issues of altruism, the reallocation of health care spending to children in response to an economic shock could also reflect the relative costs of providing health care to these family members. Relaxing our assumption that parents and children face the same costs for health care, suppose a decline in family economic status enables parents to enroll their children in Medicaid. Children will then obtain generous coverage at low or no out-of-pocket costs, while parents experience no change in the costs they face for their own care. As a result of this change in relative costs, the family may allocate more of its health care spending to children compared to adults. This may be more likely to occur in "mixed insurance" families in which adults have private coverage and children acquire more generous Medicaid coverage, or in families in which adults remain uninsured and children are enrolled in Medicaid. As we discuss in our empirical findings, we do not find evidence that the acquisition of Medicaid by the family results in a shift of family health care spending to children.

In what follows, we investigate the implications of both realized and anticipated economic shocks on the allocation of family health care spending. We do so by estimating econometric models that consider how over a two-year period, the within-family health care expenditure shares and spending levels between parents and children respond to both realized economic shocks and to anticipated changes in the family's economic prospects.

4 Data and empirical approach

4.1 Data

The data for this analysis are from the Medical Expenditure Panel Survey-Household Component (MEPS), a series of two-year panel data sets maintained by the Agency for Healthcare Research and Quality. The MEPS collects data from a nationally representative subsample of households that participated in the prior year's National Health Interview Survey. Respondents to the MEPS are surveyed five times over a period covering two calendar years regarding their own and their family members' demographic characteristics, health status, health care expenditures and utilization, health insurance coverage, income, and employment status. Our analytical data set includes pooled two-year panels from the MEPS covering the period 2004 through 2012.

Since the focus of our analysis is on intra-family resource allocation, we constructed family units and obtained family-level characteristics for each year of our two-year panels based on the characteristics of individual family members, family-level income, the insurance status of each family member, and each parent's

employment history. Our sample of families consists of those with all members present for both years of the two-year panel and related by marriage or by birth. We excluded families with individuals ages 65 years or older since such families typically have members covered by Medicare. Such families are less likely than families with non-elders to be affected by an economic shock that would compromise their health care spending or would require a spending reallocation away from the elderly family member. Additionally, families with elders may exhibit greater health care spending on average than those without elders.

We also excluded families with births during the two-year period since such families may have experienced a one-time spike in their health care spending associated with pre-natal care and childbirth. Finally, we excluded families with children ages 18 or older in an attempt to represent only nuclear families without children residing outside the household who may have access to other sources of medical care (such as care obtained through a college health plan), or who through their own employment, obtained income and health insurance that were unlikely to be affected by an economic shock experienced by their parents.

These exclusions resulted in a sample size of 43,629 individuals representing 13,821 families. Additionally, since our analysis focuses on the intra-family health care allocation among adults and children, we restricted our analysis to married couples and single-parents (mothers) with children. These restrictions yielded samples of 5972 two-parent families with children and 2999 single-mother families for a total sample size of 8971 families. Finally, we constrained our analysis to families with positive health care spending in both years in order to assess the change in resource allocation for families who used health services in both periods. These restrictions yielded a sample of 2993 single-mother families and 5967 two-parent families for a total sample of 8960 families.

MEPS data on health care expenditures represent the sum of direct payments for health care services provided during the year. This includes out-of-pocket payments and payments by private insurance, Medicaid/CHIP, Medicare, and other sources.⁵ We obtained total spending for each family member as well as their spending for selected health services (total ambulatory care, office-based physician care, prescription drugs, and dental care). For each family, we then aggregated the individual-level health care spending to obtain total family health care spending, and then created variables accounting for the share of total spending incurred by parents and by children.

In our analysis, we focus on total health care spending for two reasons. First, compared to out-of-pocket spending, total health care spending represents a measure of the family's overall health care utilization. Second family decision-makers may be

⁵ While total health care spending is obtained on this basis for all individuals regardless of their insurance status, the prices governing spending may differ depending upon an individual's insurance status. In particular, spending by privately and publicly insured individuals may reflect negotiated prices. Uninsured individuals do not face negotiated prices and thus for given services, may have higher expenditures than those with coverage. Nevertheless, we follow the convention in MEPS of using the reported payments by the sources noted above to obtain spending measures.

uncertain as to their out-of-pocket spending responsibility and thus make their decisions based on total spending requirements.⁶ We express total health care spending by the family in 2012 dollars. Thus, our key outcomes of interest are *the shares of family health care spending* for parents and for children, and *total health care spending* for each of these groups. Our empirical work also includes analyses of how total spending for children and adults for each of the specific services noted above changes in response to an economic shock.

4.2 Empirical approach: economic shocks and children's share of health spending

To assess how the intra-family allocation of health spending responds to realized and anticipated economic shocks, we examine the within-family change in the share of family health spending allocated to children over the two-year MEPS observation periods. We do so by estimating fractional probit models (FRM) using the correlated random effects (CRE) method to control for time-invariant, unobserved heterogeneity across family units (Papke and Wooldridge 2008; Wooldridge 2010). Since we are modeling proportions (the share of total family health care spending allocated to children) as the outcome of interest, the FRM constrains estimates of expenditure shares to fall within the zero – one bound.

Following Wooldridge (2010), the FRM takes the following functional form using the probit response function:

$$P(y_{it} = 1 | x_{it}, a_{it}, r_{it}, c_i) = \Phi(x_{it}, a_{it}, r_{it}c_i)$$

for the i^{th} family over time periods $t = 1, \dots, T$.

Here, y_{it} represents the proportion (share) of family health care spending allocated to children in family i , in year t , x_{it} represents a vector of explanatory variables describing family (child and parent) characteristics (some of which will vary over time), a_{it} is a vector of economic shocks anticipated by family i in time t , r_{it} is a vector of realized economic shocks confronting family i in time t , and c_i represents a vector of unobserved time-invariant family effects. Variables included in this specification are described below.

The CRE approach imposes a strong assumption regarding the dependence between the unobserved family effects c_i and the observed explanatory variables x_{it} . Specifically this dependence is assumed to follow the conditional normal distribution (Mundalk 1978 and Chamberlain 1980) where $c_i \sim \text{Normal}(\psi + \bar{x}\xi)$, and \bar{x} represents a vector of values for the time-varying explanatory variables averaged over our two-year observation period. By including the latter variable averages, we control for possible correlation between c_i and the explanatory variables. In addition, we also include time-specific dummy variables and time-invariant explanatory variables in the FRM specification. The CRE approach has been applied to various nonlinear models, including probit models (Wooldridge 2010), fractional response models (Papke and Wooldridge 2008), and two-part expenditure models (Mora et al. 2015).

⁶ It is well known that individuals are not well informed regarding the specific payment provisions of such policies and thus face uncertainty regarding their out-of-pocket spending obligations. See for example Lowenstein et al. (2013), Kleff (2013), and Cunningham et al. (2001).

We estimate FRM models for single-mother and two-parent families using the *fractreg* procedure in STATA 14, and obtain marginal effects through STATA's *margins* procedure. We apply MEPS longitudinal sampling weights to these estimates, and to account for the non-random design of MEPS, we cluster standard errors at the MEPS primary sampling unit.⁷

4.3 Health care spending by children and their parents

To identify the spending changes underlying shifts in the share of family health care spending allocated to children, we estimate expenditure models separately for children and parents. Specifically, for each, we estimate two-part expenditure models for total spending and for spending on specific health care services. We first estimate a probit model for the likelihood of incurring health spending, $\text{Prob}(y_{it} > 0) = \Phi(x_{it}, a_{it}, r_{it})$ where Φ is the cumulative standard normal distribution and as before, x_{it} is a vector of child, parent, and other family characteristics, a_{it} is a vector of anticipated economic shocks, and, r_{it} is a vector of realized economic shocks. The second part of the model is a generalized linear expenditure model (GLM) for children and for parents with positive spending and takes the following form:

$$E[y_{it}/x_{it}, a_{it}, r_{it}] = \mu = f(x_{it}, a_{it}, r_{it}).$$

$E[y_{it}/x_{it}, a_{it}, r_{it}]$ and μ represent mean expenditures for children and for parents in family i at time t conditional on children, parent, and family characteristics x_{it} , anticipated economic shocks, a_{it} , and realized economic shocks r_{it} . The GLM model employs a link function which relates the conditional mean $E[y_{it}/x_{it}, a_{it}, r_{it}]$ to the vector of explanatory variables, and a logarithmic link is typically used in expenditure studies to address the skewness of the health spending distribution. The GLM model also requires specification of a variance function for the conditional mean, and we applied the modified Park's test to select the variance function. We further applied the Hosmer-Lemeshow test to assess the goodness of fit of the model.⁸

Next, we apply the CRE framework to both parts of the expenditure model by including average values of the time-varying explanatory variables, thereby obtaining estimates of the within-family change in children's and parents' health care spending over our two-year observation period. We use STATA's *twopm* routine to estimate the probit and GLM models (Belotti et al. 2015) and using both parts of the model, obtain estimates of expected health care expenditures. Finally, we use STATA's *margins* command to obtain average marginal effects: the change in predicted expenditures due to changes in our economic shock variables.

⁷ We derived family weights for our two-year panel file using family weights from the full-year MEPS file corresponding to the second year of each longitudinal file and adjusted these weights for our specific sample. We did this by multiplying by the ratio of the sum of family weights in this second-year file to the sum of family weights for families who remained in the two-year panel in the full-year file. We thank Steven Hill of AHRQ for his advice on this weighting issue.

⁸ Park's test involves regressing the log of the squared residuals from a designated expenditure function on the predicted values of expenditures. The Hosmer-Lemeshow test involves regressing the residuals from the expenditure model on the deciles of predicted expenditures. An insignificant joint-F-test of the coefficients indicates that the model fits the data well.

4.4 Specific variables

4.4.1 Family and individual characteristics

In the expenditure shares and two-part expenditure models, we control for various family and individual characteristics. Recognizing that mothers typically make health care decisions for their children, we control for maternal characteristics including age, education, race/ethnicity, whether the mother is in fair/poor health, whether and whether the mother has a MEPS priority health condition (we include diabetes, asthma, arthritis, chronic heart disease).⁹ In two-parent families, we also include characteristics of the father to account for his influence on family health care spending. Additionally, we include the number of children in the family less than age 5, the number between ages 5 and 17, the number of children in fair/poor health, and the family's region of residence.

4.5 Realized economic changes

To assess the impact of realized changes in economic status over the two-year observation periods, we fit the above models using measures of family income, employment status, and health insurance status for each year of the two-year panel. With regard to income shocks, we begin by including dummy variable indicating family income relative to the federal poverty line (FPL), specifically, whether the family is classified as poor (less than the federal poverty line FPL), near-poor (100% to less than 125% of the FPL), low income (125% to less than 200% of the FPL), middle income (200% to less than 400% of the FPL), with high income families (400% of the FPL or more) as the reference group.¹⁰ We then empirically estimate the impact of an income loss on our outcomes of interest by examining shifts from higher to lower income categories by families in our sample. To do so, we first predict the average marginal effect of each income class variable relative to the reference group, and then we compute the differences in these predicted average marginal effects between income categories to assess the impact of an income loss.

We implement a similar procedure for changes in the family's employment status and health insurance status. We characterize the family's employment status during each year of the two-year panel with a set of dummy variables. For single-mother families, these variables indicate whether the mother was continuously employed all year (the reference group consists of those not employed all year or those employed only part year) and for two-parent families, we use similar variables indicating

⁹ In addition to the MEPS priority conditions selected, other priority conditions include angina, high blood pressure, high cholesterol, emphysema, stroke, and other heart conditions. Since a number these conditions were highly correlated, we restricted the conditions to those included in the text.

¹⁰ Although we measure continuous income inflated to 2012 dollars, we focus on the poverty level measures for the following reasons. First these measures capture any non-linearity in the income/expenditure share relationship. Also, movement across these categories over time represents significant income shifts. For example, moving from the income threshold of four times the FPL in 2012 for a family of four to the threshold for three times the FPL represents an income loss of over \$30,000 (\$92,200 to \$69,150). Such a dramatic shift is not likely to be captured using a continuous measure of income. The disadvantage in using the FPL measure is that we can miss some significant changes *within* FPL classes.

whether both parents were employed all year (the reference group consists of parents not employed all year or employed only part year) for each parent. We account for changes in the family's health insurance status over each year in the two-year panel using dummy variables indicating whether all family members were insured during the year or whether at least one but not all family members lacked coverage all year (families with all members uninsured are the reference group). As with our estimates of the impact of income losses, we predict the average marginal effect for the employment and insurance variables relative to their reference groups to obtain the impact of employment and health insurance losses. Finally, note that in our fractional response models, the derived marginal effects of each set of these economic status dummy variables convey *the within-family change in economic circumstances* over the two-year panel observation period.

4.6 Anticipated economic changes

To assess the impact of anticipated economic shocks, we examined the contribution of variables capturing macroeconomic conditions as well as variable indicating time periods encompassing the Great Recession. As regards the former, we included the national unemployment rate at mid-year from the Bureau of Labor Statistics. We also included the Federal Housing Finance Agency's index of housing prices at mid-year, which is a repeat sale index measuring the movement of single-family house prices. The index measures average price changes in repeat sales or re-financing of the same properties, and thus provides a measure of housing price trends (for a detailed description see <https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx>). Finally, while we also considered using the Standard and Poor's closing stock market index at mid-year, we relied primarily in the unemployment rate and housing price index.¹¹

To assess the impact of the Great Recession, we created several dummy variables indicating the two-year time periods in which families in specific MEPS panels were observed. Families whose two-year observation period occurred during the 2004–2006 period were designated with the dummy variable PRE1 and PRE2 indicating that they were in the first or second year MEPS panels in pre-recession period. Those whose two-year observation periods spanned the years 2006–2008 were designated with the dummy variables ONSETP1 and ONSETP2 indicating that they were in the first or second year of the recession's onset; those whose two-year observation periods fell primarily in the recession period (2008 to 2010) were designated with the dummy variable REC1 and REC2; while those observed during the 2010–2012 post-recession period were designated with dummy variables POST1 and POST2. The difference in the estimated year-specific marginal effects (e.g., REC2 – REC1) represents the *within-family change* in outcomes of interest between the first and second years of these time periods. However, the key test for these time

¹¹ The stock market price and housing price market price indexes were highly correlated (simple correlation of 0.41 for single-mother families and 0.45 for two-parent families). However, during our observation period, stock ownership declined precipitously from 61% of Americans in 2004 to 53% in 2012 (according to Gallup surveys), while home ownership remained somewhat more stable declining from 68.8% of Americans in 2004 to 65.4% in 2012 (according to the Federal Reserve Bank of St. Louis). Thus, we included only the housing price index surmising that its change is meaningful to more individuals than movements in stock market prices.

period variables is to determine whether the change in outcomes over the two-year onset, recession, and post-recession time periods differs significantly from the change in outcomes over the two-year pre-recession period.

5 Findings

5.1 Characteristics of single mother and two-parent families

In Table 1, we present selected characteristics of our single-mother and two-parent families based upon data from individuals in the first year of each MEPS panel. While health spending per family member in each family type is roughly the same, we find that two-parent families allocate a somewhat greater proportion of family health care spending to children (48.8% compared to 42.5% in two-parent families). We also observe single-mother families at a significant disadvantage with regard to economic status. Family income for single-mother families is just a third (36.2%) of that for two-parent families, reflecting the presence of a working spouse in the latter families (where nearly 90% of fathers are employed). Nearly two-thirds (62.6%) of single mothers have low incomes or are poor or near-poor compared to only 22.7% of two-parent families. By contrast, just over a third of two-parent families are middle income and 40.9% are high income (compared to only 26.6% and 11.2% of single-mother families, respectively).

These differences in economic status by family type are also reflected in differences in mother's education and race/ethnicity. We find that twice the percentage of mothers in two-parent families graduated from college compared to those in single-mother families (41.5% to 19.4% respectfully). Given earnings disparities between whites and other racial/ethnic groups, the differences in economic status between single-mother families and two-parent families may also reflect the significantly higher proportion of white mothers in the latter families.

We also find that single-mother families are less likely to have very young children compared to two-parent families (27.9% compared to 35%), and that the health status of children and mothers in single-parent families is inferior to that in two-parent families. On average, the number of children in fair/poor health in single-mother families is nearly three times that in two-parent families (0.11 compared to 0.04), and the likelihood that a mother in a single-mother family will be in fair/poor health is nearly twice that found in two-parent families (22.5% compared to 11.8%). Finally, we find that single-mothers are more likely to have MEPS priority health conditions than married mothers, specifically with regard to diabetes (5.05% compared to 3.05%), asthma (13.45% compared to 8.50%) and arthritis (14.81% compared to 11.30%). Finally, mean baseline year measures of the national unemployment rate, the Federal Housing Finance Agency's index of housing prices, and Standard and Poor's closing stock market index, variables that are used to construct measures of anticipated economic shocks, are roughly equivalent for single-mother and two-parent families.¹²

¹² The slight differences in the mean estimates of these measures between single-mother and two-parent families reflect differences in the distribution of these families across baseline years in the MEPS panel data.

Table 1 Descriptive statistics: family characteristics at baseline: mean values (standard errors)

	Single-mother families ($N = 2993$)	Two-parent families ($N = 5967$)
Children's share of health spending	48.8% (0.83)	42.5% (0.52)
Health spending per family member	\$2394 (139)	\$2375 (58)
Mother's age in years	36.1(0.22)	38.9 (0.13)
Family income (2012 dollars)	\$33,685 (937)	\$92,990 (1480)
Percent < 125% FPL	41.4 (1.16)	10.3 (0.48)
Percent 125% to 199% FPL	21.2 (0.95)	12.4 (0.58)
Percent 200% to 399% FPL	26.2 (1.06)	36.4 (0.82)
Percent > 400% FPL	11.2 (0.97)	40.9 (0.92)
<i>Mother's education</i>		
Percent < high school	15.6 (0.73)	9.1 (0.43)
Percent high school graduate	19.4 (0.99)	23.8 (0.77)
Percent some college	30.9 (1.12)	25.6 (0.77)
Percent college & beyond	19.4 (0.99)	41.5 (0.77)
Percent families with all insured	57.8 (1.22)	75.0 (0.71)
<i>Mother's race/ethnicity</i>		
Percent White, non-Hispanic	48.8 (1.41)	71.7 (0.85)
Percent Black, non-Hispanic	30.5 (1.33)	6.2 (0.38)
Percent Hispanic	16.5 (2.12)	14.8 (0.70)
Percent other race/ethnicity	4.3 (0.47)	7.3 (0.42)
Percent with children < age 4	27.9 (1.08)	35.0 (0.77)
Percent with children > age 5	85.6 (0.88)	86.2 (0.52)
Number of children in fair/poor health	0.11 (0.008)	0.04 (0.003)
Percent of mothers in fair/poor health	22.5 (1.08)	11.8 (0.49)
Percent of mothers with diabetes	5.05 (0.51)	3.05 (0.31)
Percent of mothers with arthritis	14.81 (0.93)	11.30 (0.57)
Percent of mothers with asthma	13.45 (0.91)	8.50 (0.47)
Percent of mothers with chronic heart disease	0.96 (0.23)	0.56 (0.12)
Percent of fathers in fair/poor health	- - -	12.1 (0.53)
Percent of mothers employed all year	65.7 (1.18)	63.4 (0.008)
Percent of fathers employed all year	- - -	89.8 (0.005)
National unemployment rate at mid-year	6.69 (0.056)	6.62 (0.036)
Federal Housing Finance Agency's price index at mid-year	202.14 (0.410)	202.71 (0.265)
Standard & Poor's closing stock market index at mid-year	1209.15 (3.73)	1208.93 (2.86)

Source: Authors' estimates from MEPS longitudinal files, 2004–2012

5.2 Econometric results

5.2.1 Children's health expenditure shares

In Table 2 we present estimates of the impact of realized and anticipated economic shocks on the within-family change in the share of family health care spending allocated to children. The table provides estimates of this change for single-mother and for two-parent families over our two-year observation period. These estimates represent marginal effects presented in terms of percentage point changes in children's expenditure shares, with the estimates obtained from the FRM/CRE models.

Table 2 Within-family change in children's share of family health spending in single-mother and two-parent families: percentage point change in expenditure share over two years in response to selected economic shocks

Realized Economic Shocks	% point change in children's expenditure share (standard error)					
	Single-mother families			Two-parent families		
	Linear fixed effects:	Fractional response model:	Fractional response model:	Linear fixed effects:	Fractional response model:	Fractional response model:
<i>Income shock: change from</i>						
High income to middle income	4.04 (3.12)	3.69 (3.04)	1.20 (1.30)	1.25 (1.31)		
High income to low income	8.73 ** (3.88)	8.32** (3.80)	0.46 (1.90)	0.42 (1.90)		
High income to near-poor income	16.20*** (4.41)	15.74*** (4.33)	-0.72 (2.34)	-0.68 (2.73)		
High income poor income	11.74*** (4.27)	11.35*** (4.20)	2.00 (2.49)	2.11 (2.49)		
Middle income to low income	4.65 (2.90)	4.63 (2.92)	0.74 (1.63)	0.83 (1.61)		
Middle income to near-poor income	12.03*** (3.46)	12.05*** (3.50)	1.92 (2.56)	1.93 (2.57)		
Middle income to poor income	7.70** (3.51)	7.66** (3.51)	-0.81 (2.32)	-0.87 (2.32)		
Low income to near-poor income	7.47*** (2.78)	7.42*** (2.74)	1.18 (2.43)	1.10 (2.44)		
Low income to poor income	3.01(2.58)	3.03 (2.58)	-1.55 (2.25)	-1.70 (2.25)		
Near poor income to poor income	-4.46* (2.50)	-4.39* (2.51)	-2.73 (2.78)	-2.80 (2.80)		
<i>Health insurance shock: change from</i>						
All members insured to no members insured	-9.63 (8.81)	-9.56 (8.60)	0.40 (5.50)	0.44 (5.41)		
Some members insured to no members insured	-10.23 (8.57)	-10.19 (8.35)	2.17 (5.34)	-10.19 (8.35)		
<i>Employment shock: change from</i>						
Parents employed all year to not employed all year	1.99 (2.70)	1.99 (2.69)	-0.16 (2.50)	-0.08 (2.53)		
Pre-recession period (PRE2 - PRE1)	-4.81 (3.20)	-4.79 (3.19)	0.33 (1.68)	0.43 (1.68)		
Onset of recession (ONSET2-ONSET1)	2.27 (1.88)	2.20 (1.87)	-1.31 (1.14)	-1.32 (1.14)		
During recession (REC2-REC1)	-1.47 (2.14)	-1.42 (2.17)	-3.92*** (1.46)	-3.95*** (1.45)		
Post-recession period(POST2-POST1)	-1.35 (1.88)	-1.41 (2.15)	1.04 (1.14)	0.95 (1.13)		

Table 2 continued

Realized Economic Shocks	% point change in children's expenditure share (standard error)			
	Single-mother families		Two-parent families	
	Linear fixed effects:	Fractional response model:	Linear fixed effects:	Fractional response model:
Change in national unemployment rate	2.22** (0.99)	2.18** (0.99)	0.24 (0.62)	0.21 (0.62)
Change in housing price index	0.41*** (0.16)	0.41*** (0.16)	-0.09 (0.09)	-0.10 (0.09)
Overall R-square/Pseudo-R-square	.0487	3.40	.0307	2.06
Wald Chi-square				
Number of families	2840		5747	

Source: Authors' estimates from MEPS longitudinal files, 2004–2012. * Statistically significant at $p < 0.10$; ** at $p < 0.05$; *** at $p < 0.01$

Model specifications include the following set of family characteristics: For single-mother families, mother's age and education; mother's race/ethnicity; whether the mother is in fair/poor health; whether the mother has a selected MEPS priority health condition (diabetes, asthma, arthritis, chronic heart disease); the number of children in fair/poor health; number of children < age 5; number of children ages 5–17; and the region in which the family resides. Characteristics of two-parent families include mother's age and race/ethnicity; highest education obtained by a parent; whether a mother or father is in fair/poor health; whether a mother or father has a selected MEPS priority condition; the number of children in fair/poor health; number of children < age 5; number of children ages 5–17; and the region in which the family resides. In both specifications. Realized economic shocks are based upon changes over our two-year observation period in family income categories defined as a percent of the federal poverty line; in parent's employment status; and in family insurance status. We use differences in predicted average marginal effects between income categories, family insurance status and family employment status to assess the impact of a realized income shock. Anticipated economic shocks are based upon estimates of the average marginal effects of changes in the national unemployment rate and the housing price index over our two-year observation period. Anticipated economic shocks are also captured through dummy variables associated with the Great Recession and related time periods. These dummy variables indicate whether the family is observed in the first or second year of the pre-recession period (PRE1 or PRE2), onset of the recession (ONSET1 or ONSET2), recession (REC1 or REC2), or post-recession period (POST1 or POST2). Differences in the estimated marginal effects for these dummy variables are used to assess the change in outcomes of interest between the first and second year of each time period

For comparison, we also present findings from a linear family fixed-effects model. Since findings for the linear models are quite similar to those from the FRMs, we focus on estimates from the latter.

We begin by focusing on single-mother families. Holding the effects of changes in mother's employment and family insurance status constant, we find that realized income shocks experienced by single-mother families generally result in an increase in the share of family health care spending consumed by children. An income shock which shifts the family from high-income status to income levels below middle-income status yields an increase in children's share of the family's health care spending ranging from just over eight percentage points to nearly 16 percentage points. We also find that an income shock that shifts family income from middle income to near-poor economic status also yields a statistically significant increase in children's share of family health care spending. While these changes in the family's health care spending allocation are consistent with altruistic behavior by single-mothers toward their children, below we also consider whether this shift may be due to the family's acquisition of Medicaid coverage. The only reduction in the share of family health care spending allocated to children that we observe is from a shift in income from near-poor status to poor income. Finally, we find that losses in health insurance or employment do not have statistically significant effects on the change in children's expenditure shares. Thus large income shocks appear to dominate the impact of realized economic shocks on the share of family health care spending allocated to children.

For two-parent families, we find little evidence in Table 2 of shifts in the share of family health care spending from parents to children in response to economic shocks. We find that the changes in children's share of family health care spending in response to income shocks are relatively small and fail to attain statistical significance. In data not presented, we find no evidence of a systematic decline in the share of family health care spending of mothers or fathers in response to income shocks. We do find that a loss of employment by parents, while not changing the share of family spending allocated to children, does result in a shift of spending from fathers to mothers (an increase in mother's expenditure share by 5.26 percentage points).

Since income, insurance and employment losses are likely to be correlated and thus obscure the independent contributions of each, we conducted several sensitivity tests. We estimated FRMs for both single-mother and two-parent families without the income variables and fit models with the insurance and employment variables included either individually or together. We found no significant insurance or employment effects for either family type. In models with income shocks as the only realized economic shock variable, the estimated marginal effects were quite close to those in the original specifications reported in Table 2.

As noted above, the increase in the share of family health care spending observed for children in single-mother families in response to an economic shock could also reflect differences in the relative costs of providing health care to children and adults. This would be the case if a decline in family economic status enables parents to enroll their children in Medicaid. To assess such a possibility, we considered FRMs with family-level Medicaid variables defined as: (1) some but not all family members obtained Medicaid or (2) all family members obtained Medicaid. When we included

these variables, either separately or together and with or without the income variable variables, we found no statistically significant impact of the acquisition of Medicaid on the share of family health care spending allocated to children. Moreover, including the Medicaid variables together with the income variables did not alter the impact of changes in family income on children's expenditure shares. Finally, we also interacted the Medicaid variables with the income variables and found no significant interaction effects. Thus, while we cannot definitively rule out the possibility that the increase in the share of family health care spending allocated to children in single-mother families in response to an economic shock is due to the acquisition of Medicaid, our estimates are not consistent with such an effect.

Among our measures of anticipated economic shocks, we find that in single-mother families, changes in the national unemployment rate and in housing prices are associated with changes in children's expenditure shares. A one-point increase in the national unemployment rate yields just over a two percentage point increase in the share of spending allocated to children, suggesting that in anticipation of declining economic circumstances, single mothers will shift health care spending to children. We find that an increase in housing prices, suggestive of a more robust economic environment, yields a shift in spending from single-mothers to children (a ten point increase in the index yields a 4.1 percentage point increase in children's expenditure share). We interpret this change as reflecting the family's perception of its enhanced wealth position (in this case housing wealth) which yields a willingness by parents to invest in children's health. Such a response to rising housing prices and to the corresponding increase in perceived housing wealth has been found to increase the family's willingness to invest in higher education for children, increasing both the likelihood of college attendance and the quality of the institution attended (Loveheim 2011; Loveheim and Reynold 2013). The results reported by these authors are most salient for low-income families and thus consistent with the characteristics of our single-mother families. In our discussion below of results from Table 5, we identify the health care expenditure changes underlying the impact of the increase in housing prices on the increase in children's expenditure shares. By contrast, we find that changes in the unemployment rate and in the housing price index have no impact on children's expenditure shares in two-parent families. Finally, as regards the impact of the Great Recession on children's share of health care spending, we find that in contrast to single-mother families, the share of spending allocated to children declined during the recession by roughly four percentage points.

As noted earlier, assessing the impact of time periods encompassing the Great Recession involves a comparison of the change in children's expenditure shares during these periods *relative to* the change during the pre-recession period. We present such comparisons in Table 3. We find that compared to the change in children's expenditure share during the pre-recession period, single-mother families increased the share of family health care spending to children during the onset of the recession by nearly seven percentage points. By contrast, during the recession, the share of family health spending allocated to children in single-mother families declined by 4.38 percentage points compared to the change in the pre-recession period.

Table 3 Did the great recession affect the within-family change in children's share of family health spending in single-mother and two-parent families? Percentage point change in children's expenditure share over specific time periods encompassing the great recession

	Single-mother families <i>N</i> = 2840	Two-parent families <i>N</i> = 5747
<i>Two-year change during:</i>		
Pre-recession period (PRE2 – PRE1))	–4.79 (3.19)	0.43 (1.68)
Onset of recession (ONSET2-ONSET1)	2.20 (1.87)	–1.32 (1.14)
During Recession (REC2-REC1)	–1.42 (2.17)	–3.95** (1.45)
Post-recession period(POST2-POST1)	–1.41 (2.15)	0.95 (1.13)
<i>Change between time periods:</i>		
Onset period vs. pre-recession period:	6.99* (4.23)	–1.74 (2.32)
Recession period vs. pre-recession period	3.37 (2.24)	–4.38* (2.46)
Post-recession period vs. pre-recession period	3.38 (2.25)	0.53 (2.19)

Source: Authors' estimates from MEPS longitudinal files, 2004–2012

* Statistically significant at $p < 0.10$; ** at $p < 0.05$; *** at $p < 0.01$.*

5.3 Selected health services for single mothers and children

The findings in Table 2 indicate that in single-mother families, economic shocks are associated with an increase in the share of family health care spending allocated to children. To provide more detail on the nature of these shifts, in Table 4 we present results from FRMs estimating the within-family change in the share of family health care spending consumed by children for specific health services. We restrict our estimates to single-mother families given the lack of findings for two-parent families.

Focusing on spending for all ambulatory care services, office-based visits, prescription drugs, and dental care, we generally find that income shocks are associated with an increase in the share of family health care spending for children for each of these services, although some of the changes are imprecisely estimated. For example, we find that a decline in income from high-income status to near-poor income status yields an increase of 11.63 percentage points in the share of family spending for total ambulatory care going to children, and that a 10.25 percentage point increase in the share of family spending for office-based physician care going to children. A decline from middle income to near-poor economic status results in statistically significant increases in children's shares of family health spending for all ambulatory care services, for office-based services, and for prescription drugs. We also find that economic shocks that reduce income from low income to near-poor income result in increases in the share of family health care spending allocated to children for ambulatory care services and for prescription drugs, and that a decline from low income to poor income status is associated with an increase children's share of family dental care spending. By contrast, and as before, a reduction in income from near-poor status to poor status reduces children's share of total family health spending. Finally, we find that a loss of insurance in single-mother families results in a substantial decline, by nearly twenty-five percentage points, in children's share of family prescription drug spending.

Table 4 Within-family change in children's share of family health spending for selected services in single-mother families: percentage point change in expenditure share over two years in response to selected economic shocks

Realized economic shocks	Total ambulatory care N = 2627	Office-based physician care N = 2476	Prescription drugs N = 2303	Dental care N = 919
<i>Income shock: change from</i>				
High income to middle income	1.31 (3.77)	1.16 (3.58)	0.48 (3.60)	6.41 (6.04)
High income to low income	2.92 (4.84)	4.19 (4.57)	1.01 (4.52)	6.58 (7.16)
High income to near-poor income	11.63** (5.27)	10.25* (5.67)	7.90 (4.93)	14.36 (9.10)
High income poor income	5.72 (5.04)	5.95 (5.07)	1.32 (4.91)	16.07* (8.66)
Middle income to low income	1.61 (3.22)	3.03 (3.14)	0.53 (3.05)	.017 (5.38)
Middle income to near-poor income	10.32 ** (4.16)	9.10** (4.57)	7.42** (3.61)	7.95 (6.74)
Middle income to poor income	4.41 (3.70)	4.79 (3.82)	0.84 (2.92)	9.66 (6.37)
Low income to near-poor income	8.71** (3.70)	6.07 (3.75)	6.89 ** (3.22)	7.77(5.90)
Low income to poor income	3.52 (3.47)	1.76 (2.97)	0.31 (3.1)	9.49* (5.28)
Near poor income to poor income	-5.90* (3.11)	-4.61 (3.61)	-6.58** (2.98)	1.71 (6.98)
<i>Health insurance shock: change from</i>				
All members insured to no members insured	1.09 (9.20)	4.89 (9.80)	-24.48*** (8.82)	-3.83 (15.52)
Some members insured to no members insured	0.85 (8.92)	4.61 (9.49)	-23.92*** (8.62)	-7.58 (15.00)
Total ambulatory care Office-based physician care Prescription drugs Dental care				
<i>Employment shock: Change from</i>				
Parent employed all year to not employed all year	-2.17 (3.11)	-3.47 (3.19)	0.63 (2.69)	7.60 (5.16)
Anticipated economic shocks				
Increase in national unemployment rate	2.64** (1.15)	3.08*** (1.14)	0.84 (1.11)	3.39 (2.10)
Increase in housing price index	0.33* (0.19)	0.18 (0.20)	0.17 (0.19)	0.21 (0.33)
Number of families Pseudo-R-square	2627 .0602	2476 .0609	2302 .0735	919 .0508

Source: Authors' estimates from MEPS longitudinal files, 2004 to 2012. See Table 2 notes for description of model specification

* Statistically significant at $p < 0.10$; ** at $p < 0.05$; *** at $p < 0.01$

As before, we find that a change in anticipated economic shocks as captured by an increase in the national unemployment rate increases children's share of family health care spending for ambulatory care services and for office-based physician services. These expenditure shares change by 2.64 and 3.08 percentage points respectively for a one-point change in the unemployment rate. We also find that an increase in the housing price index increases children's share of family spending on ambulatory care consistent with the perceived wealth effect noted above (a ten-point increase in the index yields a 3.3 percentage point increase in the share of family ambulatory care spending for children).

5.4 Health care spending of children and single mothers

To understand the nature of the change in children's expenditure share, we next examine separate GLM models of health care spending by children and parents. Once again, given the lack of findings of shifts in spending to children in two-parent families, we restrict our expenditure model estimates to single-mother families. We model total health care as well as spending on total ambulatory care services, office-based visits, prescription drugs and dental care using variables included in the FRM models. The GLM models employ a logarithmic link function, and the modified Parke's test determined that the variance function typically follows a Poisson distribution. Finally, we examined the goodness of fit of models using the Hosner-Lemeshow test. Most of our models passed this test and those that did not had very low F-statistics and exhibited no systematic relationship between the residuals of predicted spending and the deciles of predicted spending.

Results for the expenditure models are displayed in Table 5. While a number of the estimates are not precisely measured, we find a specific pattern of spending changes for children and single mothers. In general, we find that economic shocks result in an *increase* in spending on behalf of children and this is typically accompanied by a *decline* in mother's spending, or in some cases, an increase in mother's spending that is far below the increase in children's spending. These patterns are consistent with the observed shift in expenditure shares to children reported earlier. As examples, a reduction from high income status to near-poor status results in a \$713 increase in spending on children's dental care and a \$222 decline in mother's dental care spending. While prescription drug spending declines for both children and mothers in response to an income shock, the decline in children's spending is far less than that the decline in mother's spending. Other examples of these tradeoffs are apparent throughout the table. The only departure from this pattern for realized economic shocks is for insurance losses which for dental care appear to shift spending away from children and toward the single-mother.

As regards anticipated economic shocks, we find that increases in the unemployment rate appear to increase total and ambulatory health care spending for children (by \$807 and \$292 respectively) while the increase in spending for single mothers is smaller and not statistically significant. The only departure from this pattern is for prescription drug spending, but the increase in single mothers' drug spending is not significantly different from the increase in children's spending. Finally, we find that an increase in housing prices results in an increase in children's total health care spending and their spending for ambulatory care, while mother's

Table 5 Within-family change in mother's & children's spending for health services in single-mother families over two years in response to selected economic shocks

Realized economic shocks	Total health spending number of families = 2989		Dental care spending/Number of families = 2040 (for children age 5 or older)		Prescription drug spending number of families = 2989		Ambulatory care spending number of families = 2989				
	Children	Mothers	Children	Mothers	Children	Mothers	Children	Mothers			
<i>Income shock: change from</i>											
High income to middle income	642.42 (642.50)	\$312.77 (640.98)	266.35* (146.23)	33.86 (70.36)	2.31 (80.41)	118.70 (128.32)	-60.62 (213.73)	-364.53 (362.33)			
High income to low income	641.34 (819.08)	-182.62 (693.83)	294.61 (204.49)	-115.54 (83.77)	-63.25 (88.05)	-166.65 (243.50)	-187.03 (251.54)	-193.91 (383.50)			
High income to near-poor income	1190.41 (960.33)	-51.39 (640.44)	712.60*** (270.00)	-221.64* (121.60)	-189.01** (89.85)	-256.32 (229.59)	-35.54 (276.96)	-442.94 (540.68)			
High income poor income	1850.84 (1160.53)	-51.39 (690.44)	356.67 (207.98)	-212.64* (126.94)	-65.91 (98.55)	-138.57 (229.60)	-222.49 (273.43)	-174.64 (540.81)			
Middle income to low income	1.09 (337.53)	-494.39 (475.33)	28.26 (141.30)	-149.40** (64.23)	-65.56* (39.19)	-285.35 (215.09)	-126.41 (136.04)	-170.61 (233.27)			
Middle income to near-poor income	547.98 (494.66)	-116.5* (61.66)	466.25** (225.37)	-255.50** (106.46)	-191.32*** (62.21)	-375.02*(203.68)	25.08 (157.02)	-78.42 (448.90)			
Middle income to poor income	1208.41* (674.50)	-364.16 (462.48)	70.06 (146.02)	-246.10** (109.95)	-65.59 (39.19)	-257.26* (148.28)	-161.87 (154.42)	189.89 (296.01)			
Low income to near-poor income	549.07 (409.04)	-622.11 (470.27)	417.99** (197.48)	-106.10 (88.73)	125.76** (52.90)	-89.67 (145.46)	-151.49 (149.03)	-249.03 (339.67)			
Low income to poor income	1209.50** (538.58)	130.23 (361.19)	41.76 (147.64)	-96.70 (76.94)	-2.67 (53.47)	-28.08 (114.64)	-35.46 (139.61)	19.27 (198.97)			
Realized economic shocks											
Total Health Spending			Dental Care Spending			Prescription Drug Spending			Ambulatory Care Spending		
	Children	Mothers	Children	Mothers	Children	Mothers	Children	Mothers	Children	Mothers	
<i>Income shock: change from</i>											
Near-poor income to poor income	660.43 (502.11)	752.34 (471.13)	-376.23* (194.80)	9.40 (94.00)	123.10** (53.10)	177.75 (165.75)	-186.95 (128.62)	268.30 (314.54)			
<i>Health insurance shock: change from</i>											
All members insured to no members insured	-799.50 (688.80)	794.20 (1085.04)	-696.36* (415.63)	-142.90 (122.33)	-64.97 (119.52)	-61.20 (359.02)	111.11 (409.24)	253.81 (516.47)			

Table 5 continued

Realized economic shocks	Total Health Spending		Dental Care Spending		Prescription Drug Spending		Ambulatory Care Spending	
	Children	Mothers	Children	Mothers	Children	Mothers	Children	Mothers
Some members insured to no members insured	-351.75 (655.21)	1213.59 (1061.74)	-691.28* (384.88)	-62.70 (110.81)	-199.40* (111.07)	-299.15 (347.81)	345.25 (387.96)	389.69 (466.23)
<i>Employment shock: change from</i>								
Parent employed all year to not employed all year	221.16 (512.52)	201.62 (426.74)	-38.15 (180.49)	50.70 (64.73)	90.63 (112.83)	-50.70 (64.73)	291.90* (161.72)	-198.81 (241.75)
<i>Anticipated economic shocks</i>								
Increase in national unemployment rate	807.35** (360.64)	180.49 (176.62)	-40.54 (81.55)	-38.19 (25.98)	51.06 (33.84)	100.02** (40.98)	292.39** (128.55)	40.83 (123.78)
Increase in housing price index	99.42** (41.03)	57.45** (27.78)	-40.54 (81.55)	-38.19 (25.98)	-9.50 (10.88)	-7.52 (10.30)	28.97** (11.49)	-39.27** (15.68)

Source: Authors' estimates from MEPS-HC longitudinal files, 2004–2012. See Table 2 notes for description of model specification

* Statistically significant at $p < 0.10$; ** at $p < 0.05$; *** at $p < 0.01$

Table 6 Did the great recession affect the within-family change in spending for children' and parents in single-mother families? Total spending change over specific time periods encompassing the great recession

<i>Two-year change in spending during:</i>	Children	Mothers
Pre-recession period (PRE2 – PRE1))	-\$1615.90** (631.33)	\$604.39 (506.09)
Onset of recession (ONSET2-ONSET1)	–406.76 (280.40)	–1931.64*** (402.28)
During Recession (REC2-REC1)	–231.96 (321.83)	–920.98** (443.59)
Post-recession period(POST2-POST1)	229.81 (352.48)	–86.39 (327.96)
<i>Change between time periods:</i>		
Onset period vs. pre-recession period:	1214.14* (712.97)	–2536.03*** (812.60)
Recession period vs. pre-recession period	1383.94 (851.76)	–1525.37** (726.37)
Post-recession period vs. pre-recession period	1386.09 (626.17)	–690.78 (577.66)

Source: Authors' estimates from MEPS longitudinal files, 2004–2012

* Statistically significant at $p < 0.10$; ** at $p < 0.05$; *** at $p < 0.01$

spending for the former increases by less than that of children and mother's spending for the latter actually declines. While these changes are consistent with the increase in children's expenditure shares for these services as reported in Tables 2 and 4, the findings for total health care spending for mothers and children are imprecisely estimated. Only the difference in spending changes for ambulatory care is statistically significant. Finally, we also examined how spending between children and single mothers changed during the time periods associated with the Great Recession. Results in Table 6 reveal that during the pre-recession period, children's health care spending declined by \$1616 while the change in mother's spending was not statistically significant. During the onset of the recession and during the recession, mother's spending declined by \$1932 and \$921 respectively while, the change in children's spending was not statistically significant. As discussed previously, however, the impact of the Great Recession on spending by the family requires a comparison of spending in these periods relative to the change in spending during the pre-recession period. Results reported in the bottom panel of Table 6 indicate that during the onset of the Great Recession (encompassing 2006 – 2008), total spending on behalf of children increased by \$1214 and that of single mothers declined by \$2536 compared to the change in spending for each of these groups in the two-year period prior to the recession. While we also observe an increase in children's spending and a decline in mother's spending during the recession, only the decline in mother's spending during the recession is significantly different than the change in mother's spending during the pre-recession period.

5.5 Health shocks and children's expenditure shares

As a final analysis, in part to validate our earlier work, we consider the way in which health shocks experienced by parents impact children's share of family health care spending. If family decision makers behave rationally, we would expect that families should shift spending away from children in response to the presence of a parent's health problem. In Table 7, we use results from our fractional response models of

Table 7 Health shocks and the change in children's share of family health spending

<i>Two-year change in children's share of family health spending:</i>	Single-mother families <i>N</i> = 2840	Two-parent families <i>N</i> = 5747
	Percentage point change in children's expenditure share (standard error)	
Additional child in fair or poor health	2.24 (2.31)	1.52 (1.76)
Mother in fair or poor health	-7.48*** (2.32)	-3.24** (1.48)
Mother diagnosed with diabetes	-1.25 (3.35)	-10.12* (5.66)
Mother diagnosed with arthritis	-10.42*** (3.35)	-0.83 (2.68)
Mother diagnosed with asthma	2.16 (3.60)	-3.08 (2.96)
Mother diagnosed with chronic heart disease	-28.03**(11.01)	-10.89 (13.96)
Father in fair or poor health	---	-2.35 (1.50)
Father diagnosed with diabetes	---	-9.22* (4.97)
Father diagnosed with arthritis	---	6.20 (3.24)
Father diagnosed with asthma	---	-5.55 (4.86)
Father diagnosed with chronic heart disease	---	-21.02*** (6.09)

Source: Authors' estimates from MEPS longitudinal files, 2004–2012

* Statistically significant at $p < 0.10$; ** at $p < 0.05$; *** at $p < 0.01$

children's expenditure shares for single-mother and two-parent families reported in Table 2 to investigate such behavior. In several instances we find such a shift in spending. As examples, we find that having a parent in fair or poor health results in a decline in children's spending share in both single-mother and two-parent families by 7.48 and 3.24 percentage points respectively for mothers (results for fathers in two-parent families are not statistically significant). We also find that a single mother's diagnosis of arthritis reduces the share of spending on children by 10.42 percentage points in single-mother families, and having a father with diabetes reduces the share of spending on children by 9.22 percentage points in two-parent families. We also observe that having a parent with chronic heart diseases has a profound effect on the share of family health spending allocated to children: a reduction of 28.03 percentage points in single-mother families and by 21.02 percentage points in two-parent families (when a father has this diagnosis).

6 Conclusion

An economic shock which compromises a family's economic status can have a profound impact on how the family decides to allocate its diminished resources on critical necessities. In this paper, we have considered one such decision by focusing on the intra-family allocation of health care spending between parents and children, examining such allocations in single-mother and two-parent families. Using two-year panel data from the MEPS for the years 2004 to 2012, we examined the role of realized economic shocks and anticipated changes in economic circumstances on such family decision making. More specifically, our analysis has examined how economic shocks affect the *within-family change* in overall spending and spending

for specific health services over a two-year period. Our estimates are based upon fractional response models and two-part health care expenditure models, applying the correlated random effects framework to both estimates.

Our findings for single-mother families are consistent with altruistic behavior by such parents toward their children in response to economic shocks. This is most apparent with regard to substantive reductions in income (a realized economic shock) and also with regard to increases in the national unemployment rate (an anticipated economic shock). We find that both negative economic shocks result in an increase in the *share of family health care spending* allocated to children, both in terms of children's share of overall health care spending, and at times, for children's share of family health spending allocated to ambulatory and office-based physician care, prescription drugs, and dental care. We also find that in a number of cases, these shifts in children's expenditure shares are the result of an *increase in* spending on behalf of children and a decline in spending by single mothers, and that an increase in the national unemployment rate also yields this effect. Our findings reveal no such shifts in children's expenditure shares in two-parent families. We also find that increases in housing prices, reflecting more robust economic conditions and the perception of enhanced housing wealth, are associated with an increase in spending on behalf of children in single-mother families. As we note above, such a response to increases in housing prices is also consistent with investments in education by low-income families. Finally, while our findings are consistent with altruistic behavior by single mothers, we cannot definitively dismiss the possibility that the acquisition of Medicaid by the family in response to a decline in its economic status may contribute to an increase in spending on behalf of children in these families.

Given the profound effect of the Great Recession on family economic status and expectations of future economic prospects, we also considered whether time periods encompassing the Great Recession were associated with shifts in the intra-family allocation of health spending. For single-mother families, we found that compared to the pre-recession period, the period just prior to the Great Recession (the onset period) was associated a significant increase in children's spending and a decline in mother's spending. Similar patterns emerged for the recession and post-recession periods relative to the pre-recession period, although the finding for the post-recession period was not precisely estimated. No such patterns emerged for two-parent families. We also found that the onset of health conditions among parents in both single-mother and two-parent families as expected, resulted in a shift of resources to parents.

Our findings also speak to the vulnerability of single-mother families compared to two-parent families. The fact that we find substantive shifts in the share of family health care spending from mothers to children in single-mother families in response to realized income losses (especially shifts from high and middle income to near-poor income status) may likely reflect the constrained economic circumstances of many such families who experienced such losses and the difficult tradeoffs single mothers must make to maintain the welfare of their children. By contrast, the superior economic status of two-parent families, not only in terms of income but with regard to wealth and savings, provides a cushion upon which such families can draw to compensate for income losses due to an economic shock. The response of single mothers is thus indicative of the economic disparities between such families and

intact two-parent families, and the challenges faced by single mothers regarding child and parental welfare. Finally, our findings also raise two important questions: First, is the shift in health care spending from mothers to children in single-mother families in response to a realized income shock likely to be transitory or longer term in nature? Next, are existing public policy interventions, such as the expansion of Medicaid in some states under the Affordable Care Act and current state-specific Medicaid/CHIP programs in non-expansion states, sufficient to address the health care spending consequences for single-mother families that experience an economic shock? Additional research which addresses these questions can help to more completely identify the consequences of an income shock for the allocation of health care spending in single-mother families.

Acknowledgements This research was funded by a grant from the Agency for Healthcare Research and Quality (AHRQ R01HS024053). We thank Pinar Karaca-Mandic of the University of Minnesota for comments on earlier draft of this paper. We also thank seminar participants at the Rutgers Institute for Health, Health Care Policy and Aging Research, the Rutgers School of Public Health, the Department of Economics, University of New Mexico, and attendees at the 2017 American Society of Health Economists biannual meeting for helpful comments. We also thank Samuel Zuvekas and Steven Hill of AHRQ for their expert advice on the use of MEPS data and development of longitudinal family weights. Finally, we thank two anonymous referees for their insightful comments.

Compliance with ethical standards

Conflict of interest The authors declare that we have no conflicts of interest regarding this research.

References

- Becker, G. S. (1981). *A Treatise on the Family*. Cambridge MA: Harvard University Press.
- Bellés-Obrero, C., & Castello, J. (2018). The Business Cycle and Health. Oxford Research Encyclopedia of Economics and Finance: Online Publication Apr 2018. Available at: <http://economics.oxfordre.com/view/10.1093/acrefore/9780190625979.001.0001/acrefore-9780190625979-e-282?rskey=FwBgrJ&result=1>.
- Belotti, F., Deb, P., Manning, W. G., & Norton, E. C. (2015). Twopm: Two-Part Models. *The Stata Journal*, 15(1), 3–20.
- Behrman, J. (1988). Intrahousehold allocation of nutrients in rural India: are boys favored? Do parents favor inequality aversion? *Oxford Economic Papers*, 40(1988), 3–54.
- Behrman, J. (1997). Intrahousehold distribution and the family. In Rosenzweig, M. R. and O. Stark (eds.), *Handbook of Population and Family Economics* (Vol. 1A, pp. 125–187) Elsevier: North Holland, Amsterdam.
- Bureau of Labor Statistics (2014). Monthly Unemployment Rates, 2000 to 2012. <http://data.bls.gov/pdq/SurveyOutputServlet>. Accessed 3 June 2017.
- Chamberlain, G. (1980). Analysis of covariance with qualitative data. *Review of Economic Studies*, 47(1), 225–238.
- Chen, J., Vargas-Bustamante, A., Mortensen, K., & Thomas, S. B. (2014). Using quantile regression to examine health care expenditures during the great recession. *Health Services Research*, 49(2), 705–730.
- Cunningham, P. J., Denk, C., & Sinclair, M. (2001). Do consumers know how their health insurance plan works? *Health Affairs*, 20(2), 159–166.
- Dickie, M., & Messman, V. L. (2004). Parental altruism and the value of avoiding acute illness: Are kids worth more than parents? *Journal of Environmental Economics and Management*, 48, 1146–74.

- Dickie, M., & Gerking, S. (2009). Family behavior: Implications for health benefits transfer from adults to children. *Environment Resource Economics*, *43*, 31–43.
- Dickie, M., & Salois, M. J. (2014). Altruism, efficiency, and health in the family. *Advances in Health Economics and Health Services Research: Preference Measurement in Health*, *24*, 1–32.
- Economic Policy Institute (2014). The State of Working America: real median household income. <http://stateofworkingamerica.org/chart/swa-income-figure-2a-real-median-family/>. Accessed 1 June 2017.
- Geiger, M. and Scharler, P. (2016). How do macroeconomic shocks affect expectations? lessons from survey data. Unpublished manuscript. Department of Economics, University of Innsbruck.
- Hurd, M. D., & Rohwedder, S. (2010). *Effects of the Financial Crisis and Great Recession on American Households*. Cambridge, MA: National Bureau of Research Working Paper 16407.
- Jacobson, L. (2000). The family as a producer of health – an extended grossman model. *Journal of Health Economics*, *19*, 611–637.
- Karac-Mandic, P., Yoo, S. C., & Sommers, B. (2013). Recession led to a decline in health care spending for children with special health care needs. *Health Affairs*, *32*(6), 1054–1061.
- Karac-Mandic, P., Yoo, S. C., Lee, J., & Scal, P. (2014). Family out-of-pocket health care burden and children's unmet needs or delayed health care. *Academic Pediatrics*, *14*(1), 101–108.
- Kleff, S. (2013). Do you understand health insurance? Most people don't. Wonkblog, The Washington Post, Washington, D.C. USA.
- Lovenheim, M. (2011). The effect of liquid housing wealth on college enrollment. *Journal of Labor Economics*, *29*(4), 741–771.
- Lovenheim, M., & Reynolds, C. (2013). The effect of housing wealth on college choice: Evidence from the housing boom. *Journal of Human Resources*, *48*(4), 1–35.
- Lowenstein, G., et al. (2013). Consumer misunderstanding of health insurance. *Journal of Health Economics*, *32*, 850–862.
- Mora, T., Gil, J., & Sicras-Mainar, A. (2015). The influence of obesity and overweight on medical costs: a panel data perspective. *European Journal of Health Economics*, *16*, 161–173.
- Mundlak, Y. (1978). On the pooling of time series and cross section data. *Econometrica*, *46*(1), 69–85.
- Papke, L. E., & Wooldridge, J. M. (2008). Panel date methods for fractional response rates with an application to test pass rates. *Journal of Econometrics*, *145*, 121–133.
- Pew Research Center (2010). How the great recession has changed life in America. June 30, Washington, D.C.
- Rosales-Ruiz, M. F. (2014). Family investment responses to childhood health conditions: intrafamily allocation of resources. *Journal of Health Economics*, *37*, 41–57.
- Roth, C. and Wohlfart, J. (2018). How do expectations about the macroeconomy affect personal expectations and behavior? Center for Economic Studies and ifo Institute Working Paper # 7154. July.
- Stephens, Jr., M. (2004). Job expectation, realizations, and household consumption behavior. *The Review of Economics and Statistics*, *86*(1), 253–269.
- Schaller, J. and Stevens, A. H. (2014). Short-run effects of job loss on health conditions, health insurance, and health care utilization. National Bureau of Economic Research Working Paper 19884. February.
- Wooldridge, J. M. (2010). Correlated random effects models with unbalanced panels. Unpublished manuscript. May.